Claims

[c1] An implantable spinal connector for mating a spinal fixation element to a spinal anchoring device, comprising: a clamp member having top and bottom portions that are connected to one another at a terminal end thereof such that the top and bottom portions are movable between an open position in which the top and bottom portions are spaced a distance apart from one another, and a closed position in which the clamp member is adapted to engage a spinal fixation element there between, the clamp member further including a bore extending through the top and bottom portions for receiving a locking mechanism for locking the top and bottom portions in the closed position, the bore in at least one of the top and bottom portions being internally threaded for mating with corresponding threads formed on at least a potion of the locking mechanism.

[c2] The implantable spinal connector of claim 1, further comprising a recess formed between the top and bottom portions for seating a spinal fixation element.

[c3] The implantable spinal connector of claim 2, wherein the recess is formed adjacent to said terminal end for seat-

ing a spinal fixation element therein.

[c4] The implantable spinal connector of claim 2, wherein the recess is formed in at least one of the inferior surface of the top portion and the superior surface of the bottom portion.

[c5] The implantable spinal connector of claim 4, wherein the recess is formed in each of the inferior surface of the top portion and the superior surface of the bottom portion of the clamp member.

[c6] The implantable spinal connector of claim 5, wherein each recess has a concave shape such that the recesses together define a substantially cylindrical recess when the clamp member is in the closed position.

[c7] The implantable spinal connector of claim 1, wherein the top and bottom portions are hingedly coupled to one another at the terminal end thereof.

[c8] The implantable spinal connector of claim 1, further comprising a pivot pin extending through the terminal end of each of the top and bottom portions for hingedly mating the top and bottom portions to one another.

[c9] The implantable spinal connector of claim 8, wherein the pivot pin extends through a bore formed through and

extending along a terminal end of each of the top and bottom portions of the clamp member.

[c10] The implantable spinal connector of claim 9, further comprising a recess formed between the top and bottom portions for receiving a spinal fixation element, the recess extending in a direction substantially parallel to a direction of the bore formed through and extending along a terminal end of each of the top and bottom portions of the clamp member.

[c11] The implantable spinal connector of claim 1, wherein the top and bottom portions are biased to a closed position such that a force greater than the biasing force must be applied to move the top and bottom portions to the open position.

[c12] The implantable spinal connector of claim 1, wherein the top and bottom portions are biased to an open position such that a force greater than the biasing force must be applied to move the top and bottom portions to the closed position.

[c13] The implantable spinal connector of claim 1, further comprising a locking mechanism disposable through the bore and effective to lock the top and bottom portions in the closed position to retain a spinal fixation element

there between.

[c14] The implantable spinal connector of claim 13, wherein the locking mechanism comprises a fastening element having a head and a shaft, and wherein one of the bore formed in the top portion and the bore formed in the bottom portion of the clamp member is adapted to freely rotatably receive the threaded shaft of the fastening element, and the other one of the bore formed in the top portion and the bore formed in the bottom portion is internally threaded to mate to threads formed on at least a portion of the shaft of the fastening element.

[c15] The implantable spinal connector of claim 14, wherein fastening element includes a flange formed there around and adapted to at least temporarily mate the fastening element to a spinal anchoring device.

[c16] The implantable spinal connector of claim 14, wherein the bore in the top portion of the clamp member is internally threaded for mating with corresponding threads formed on at least a portion of the shaft.

[c17] The implantable spinal connector of claim 16, wherein the threads in the bore in the top portion of the clamp member and the threads formed on at least a portion of the shaft are left-handed threads.

[c18] The implantable spinal connector of claim 16, wherein the fastening element includes a mating element formed on a distal-most end thereof for mating with a driver tool.

[c19] The implantable spinal connector of claim 18, wherein the mating element comprises a socket.

[c20] The implantable spinal connector of claim 1, wherein the bottom portion of the clamp member is formed integrally with a spinal fixation plate.

[c21] The implantable spinal connector of claim 1, further comprising a recess formed in a superior surface of the top portion of the clamp member for seating a head of a fastening element.

[c22] The implantable spinal connector of claim 1, wherein the clamp member is formed from a material that allows the clamp member to deform around a spinal fixation element disposed between the top and bottom portions when the clamp member is locked in the closed position.

[c23] An implantable spinal connector for mating a spinal fixation element to a spinal anchoring device, comprising:
a clamp member having top and bottom portions that are connected to one another at a terminal end thereof

such that the top and bottom portions are movable between an open position and a closed position;
a recess formed between a superior surface of the top portion of the clamp member and an inferior surface of the bottom portion of the clamp member, the recess being adapted to seat a spinal fixation element therein;
axially aligned, concentric bores extending through the top and bottom portions at a location spaced apart from the recess, the bores being configured to receive a locking mechanism for locking the top and bottom portions in the closed position; and
a substantially planer inferior surface extending along the bottom portion of the clamp member and configured to engage a spinal fixation plate.

[c24] The implantable spinal connector of claim 23, wherein at least one of the concentric bores includes threads formed therein.

[c25] The implantable spinal connector of claim 24, wherein the threads are left-handed threads.

[c26] An implantable spinal connector, comprising:
top and bottom portions hingedly mated to one another at a terminal end thereof, and having a recess formed there between for seating a spinal rod, the top and bottom portions being movable between an open position,

in which the portions are spaced apart from one another, and a closed position, in which the top and bottom portions are configured to engage a spinal rod disposed there between.

[c27] An installation device for implanting a spinal connector having top and bottom portions that are adapted to seat a spinal fixation element there between, the installation device comprising:
first and second opposed arms pivotally coupled to one another and movable between an open position, wherein a distal portion of each arm is spaced a distance apart from one another, and a closed position, wherein the distal portion of each arm is adapted to seat and engage a spinal connector disposed there between, the distal portion of each arm being substantially C-shaped to define a connector-receiving recess formed there between when the arms are in the closed position, and the distal portion of each arm including a connector-engaging member formed thereon and adapted to engage a connector positioned there between.

[c28] The installation device of claim 27, wherein the connector-engaging member on each arm comprises a ridge that is adapted to extend between top and bottom portions of the spinal connector.

[c29] The installation device of claim 27, further comprising a locking mechanism coupled to each of the first and second arms and adapted to lock the arms in a fixed position relative to one another.

[c30] The installation device of claim 27, wherein the distal portion of each arm includes an alignment mechanism formed thereon and adapted to align a spinal connector relative to the distal portion of each arm.

[c31] The installation device of claim 30, wherein the alignment mechanism comprises at least one tab formed on each arm.

[c32] An installation device for implanting a spinal connector having top and bottom portions that are adapted to seat a spinal fixation element there between, the installation device comprising:
an elongate shaft having a connector-receiving member formed on a distal end thereof and adapted to seat a spinal connector;
a driver shaft rotatably disposed through the elongate shaft and including a mating element formed on a distal end thereof and adapted to mate with a fastening element to rotate the fastening element relative to a spinal connector coupled to the elongate shaft, thereby mating the fastening element to the connector.

[c33] The installation device of claim 32, wherein the connector-receiving member comprises a housing having a recess formed therein for seating a spinal connector.

[c34] The installation device of claim 33, wherein the mating element on the driver shaft extends through and distally beyond the housing.

[c35] The installation device of claim 34, wherein the mating element comprises an elongate shaft, at least a portion of which is asymmetrical for extending into a socket formed in a fastening element.

[c36] The installation device of claim 35, wherein at least a portion of the elongate shaft that forms the mating element is threaded to mate with corresponding threads formed within a spinal connector.

[c37] A spinal fixation kit, comprising:
a spinal clamp adapted to seat a spinal fixation element there between, the clamp having at least one bore extending therethrough for receiving a fastening element, the at least one bore including left-handed threads formed in at least a portion thereof; and
a fastening element having a shaft including left-handed threads formed on a least a portion thereof for mating with the left-handed threads formed in at least a portion

if the at least one bore.

[c38] The spinal fixation kit of claim 37, wherein the spinal clamp includes top and bottom portions, and wherein each portion includes a bore formed therein and axially aligned with one another.

[c39] The spinal fixation kit of claim 37, wherein the fastening element includes a head formed on a proximal end of the shaft.

[c40] The spinal fixation kit of claim 39, wherein a distal-most end of the shaft of the fastening element includes a socket formed therein for receiving a driver tool.

[c41] The spinal fixation kit of claim 40, further comprising an installation device having a hollow elongate shaft with a distal, connector-receiving portion adapted to seat the connector, and a driver tool rotatably coupled to the shaft and including a distal end that is adapted to extend through the at least one bore in the connector and into the socket in the fastening element such that rotation of the driver tool is effective to mate the fastening element to the connector.

[c42] The spinal fixation kit of claim 41, further comprising a spinal anchoring element having at least one thru-bore formed therein, the fastening element being removably

matable to the at least one thru-bore in the spinal anchoring element.

[c43] A spinal fixation system, comprising:
a spinal fixation plate having at least one thru-bore formed therein; and
a spinal connector having top and bottom portions that are connected to one another at a terminal end thereof and that are adapted to retain a spinal rod there between, the spinal connector being configured to engage a superior surface of the spinal fixation plate to mate a spinal rod to the spinal fixation plate.

[c44] The spinal fixation system of claim 43, further comprising a locking mechanism adapted to lock the top and bottom portions of the spinal connector in a fixed position relative to one another to engage a spinal rod there between, the locking mechanism being further adapted to mate the spinal connector to the spinal fixation plate.

[c45] The spinal fixation system of claim 44, wherein the fastening element includes left-handed threads formed thereon for mating with corresponding left-handed threads formed within at least a portion of a bore extending through the top and bottom portions of the spinal connector.

[c46] The spinal fixation system of claim 43, wherein the top and bottom portions are connected to one another by a hinge member formed on a terminal end thereof.

[c47] The spinal fixation system of claim 43, further comprising a recess formed between the top and bottom portions of the spinal connector for seating a spinal rod.

[c48] The spinal fixation system of claim 47, wherein the recess has a substantially cylindrical shape.

[c49] The spinal fixation system of claim 47, wherein the recess extends in a direction substantially parallel to a direction of a terminal end of each of the top and bottom portions of the spinal connector.

[c50] The spinal fixation system of claim 43, wherein the top and bottom portions are biased to a closed position.

[c51] The spinal fixation system of claim 43, wherein the locking mechanism extends through the top and bottom portions to lock the top and bottom portions in a fixed position, and the locking mechanism extends at least partially into the at least one thru-bore formed in the spinal fixation plate.

[c52] The spinal fixation system of claim 51, further comprising a bore formed through each of the top and bottom

portions of the spinal connector for receiving the locking mechanism.

[c53] The spinal fixation system of claim 52, wherein the bore has an elongate slotted configuration.

[c54] The spinal fixation system of claim 52, wherein the bore is substantially cylindrical.

[c55] The spinal fixation system of claim 51, wherein the at least one thru-bore in the spinal fixation plate has an elongate slotted configuration.

[c56] The spinal fixation system of claim 51, wherein the at least one thru-bore in the spinal fixation plate is substantially cylindrical.

[c57] The spinal fixation system of claim 43, wherein the bottom portion of the spinal connector is fixedly mated to the spinal fixation plate.

[c58] The spinal fixation system of claim 43, wherein the bottom portion of the spinal connector is integrally formed with the spinal fixation plate.

[c59] A medical connector device, comprising:
a substantially J-shaped connector body having a first, substantially planar portion with a thru-bore formed therein, and a second, substantially curved portion that

extends in a direction substantially transverse to the first portion and that defines a recess for seating a spinal fixation element, the thru-bore in the first portion being positioned to receive a fastening element such that a head of the fastening element is effective to contact a spinal fixation element seated within the recess in the second portion and to lock the spinal fixation element within the recess.

[c60] A spinal fixation system, comprising:
an elongate spinal fixation element;
a spinal fixation plate having at least one thru-bore formed therein;
a connector member having a planar portion with a bore formed therein and adapted to be aligned with the at least one thru-bore formed in the spinal fixation plate, and a curved portion extending in a direction transverse to the planar portion and defining a recess for seating the elongate spinal fixation element; and
a locking mechanism having a head and a shaft adapted to extend through the bore formed in the planar portion of the connector member, the shaft being adapted to at least partially extend into the at least one thru-bore formed in the spinal fixation plate, and the head being configured to lock the spinal fixation element within the recess in the curved portion of the connector member

when the locking mechanism is in a locked position.

[c61] The spinal fixation system of claim 60, wherein the shaft of the locking mechanism is adapted to mate to the at least one thru-bore in the spinal fixation plate.

[c62] The spinal fixation system of claim 60, wherein the shaft of the locking mechanism is adapted to extend through the least one thru-bore in the spinal fixation plate and to extend into and engage bone.

[c63] A spinal fixation system, comprising:
a spinal plate having at least one thru-bore formed therein;
at least one anchoring device having a distal hook portion adapted to engage bone and a proximal receiver head adapted to receive an elongate spinal fixation element, the receiver head being positionable within the at least one thru-bore formed in the spinal plate such that a spinal fixation element disposed within the receiver head can be coupled to the spinal plate, and the spinal plate can be mated to bone.

[c64] The spinal fixation system of claim 63, wherein the spinal plate is an occipital plate having first and second opposed thru-bores formed therein, and wherein the system includes a first anchoring device having a re-

ceiver head disposed within the first thru-bore formed in the occipital plate, and a second anchoring device having a receiver head disposed within the second thru-bore formed in the occipital plate.

[c65] The spinal fixation system of claim 63, further comprising at least one locking mechanism adapted to be disposed within the receiver head of the at least one anchoring device to lock a spinal fixation element therein.